SaskPower 10-Year Transmission Development Plan

May 2002

SaskPower

Table of contents

Executive Summary i

1.0 Introduction 1

1.1 Context 1

1.2 Document Scope 2

2.0 Definition of SaskPower's Facilities 3

2.1 Grid Transmission Facilities 3

2.2 Sub-Transmission Facilities 4

2.3 Distribution Facilities 4

3.0 Transmission System Performance Criteria 5

3.1 Transmission System Adequacy 8

3.2 Transmission System Security 8

3.3 Transmission System Reliability 10

3.4 Cost Effectiveness of the Transmission System 11

4.0 Major Drivers of Need for New Transmission Facilities 12

4.1 Load Growth 12

4.1.1 Corporate 10-Year Load Forecast 12

4.1.2 Regional Load Forecast 13

4.2 Connection of New Generation 15

4.2.1 New SaskPower Generation Developments 16

4.3 Connection of New Major Loads 17

4.4 SaskPower's Open Access Transmission Tariff (OATT) 17

4.5 Aging Infrastructure 18

4.6 Compliance with NERC Reliability Standards 19

5.0 Evaluation of Requirements for Transmission System Developments 20

5.1 The Prince Albert and La Ronge Study Area 22

5.1.1 Reinforcement of the Supply to La Ronge 22

5.1.2 Transmission Reinforcement for the Prince Albert Area 24

5.2 The Meadow Lake Study Area 25

5.2.1 Reinforcement of the Supply to the Area North of Meadow Lake 25

5.2.2 Interconnection of a New OSB Plant Near Meadow Lake 27

5.2.3 Transmission Grid Reinforcement for the Meadow Lake Area 27

5.3 The Pelican Narrows – Deschambault Lake Study Area 29

5.3.1 Supply Reinforcement for Pelican Narrows – Deschambault Lake 29

5.4 The Kindersley – Kerrobert – Unit Study Area 30

5.4.1 Supply Reinforcement for the Area West of Kindersley 30

5.4.2 Transmission Reinforcement for Kindersley, Kerrobert, Unity 30

5.5 The City of Saskatoon Study Area 31

5.6 The City of Regina Study Area 33

5.7 Other Projects 35

5.7.1 Alberta – Saskatchewan Interconnection at Lloydminster 35

5.7.2 Connection of Wind Generation in the Area Southwest of Swift Current 36

5.7.3 Alberta Newsprint Mill 36

APPENDICES 37

A NERC Planning Standards – Table I 37

B Summary of Capital Expenditures on Transmission System for 2002 to 2006 39

Executive Summary

The SaskPower 10-Year Transmission Development Plan provides a discussion of SaskPower s anticipated transmission developments for the period 2002-2011.

The impetus for preparing the Transmission Development Plan is found in the work of the Transmission Line Routing Review Panel, established in June 2000. When the Transmission Line Routing Review Panel was convened, its Final Report was envisioned as a guide to help SaskPower manage these changing expectations. The Panel recommendations regarding public consultation and benchmarking have become an important part of SaskPower s efforts to ensure that corporate guidelines and processes reflect current realities and best practices within the industry.

The publication of SaskPower s 10-Year Transmission Development Plan addresses issues identified by the Panel, as found in Recommendations #4 and #5 of its Final Report:

#4 *The Panel recommends that SaskPower annually publish and communicate to stakeholders a 10-year forecast of load growth that assesses system reliability, identifies upcoming deficiencies, and outlines a general plan of improvements to address them.*

#5 *The Panel recommends that SaskPower annually publish a capital investment plan that outlines the transmission improvements planned for the next 5 years. The plan should be detailed and comprehensive and include the reason for the investment; the location, probable type, and capacity; the estimated cost; and the expected dates of public review and commissioning.*

With publication of this Transmission Development Plan, SaskPower has fulfilled the commitment made in response to the Panel s Final Report of February 2001. Starting with this first Plan, SaskPower will provide update reports on an annual basis.

This Plan discusses planned facility additions along with anticipated but unbudgeted additions to SaskPower s transmission facilities and sub-transmission facilities over the next 10 years. This Plan does not discuss planned additions to SaskPower s distribution system. This is consistent with the terms of reference for the Transmission Line Routing Review Panel and the definition of Transmission Facilities as used by the Panel.

103-05480/

The transmission developments that are discussed in this Plan are related to the reinforcement of a number of areas in the province. The prime study areas identified in the Plan are:

- ¥The Prince Albert and La Ronge Study Area,
- ¥The Meadow Lake Study Area,
- ¥The Pelican Narrows — Deschambault Lake Study Area,
- ¥The Kindersley — Kerrobert — Unity Study Area, and
- ¥The City of Saskatoon and City of Regina Study Areas.

The requirement for new transmission facilities into or within these areas is almost exclusively related to the growth of local load in the study areas. There is no discussion of specific transmission associated with new generation facilities, as at the time the Plan was prepared, no plans for major new generation developments within the province had been identified. SaskPower s Open Access Transmission Tariff may also result in requirements to build transmission facilities within the province. There are a number of requests for transmission service pending under the provisions of the tariff. However, at the time of preparation of this Plan, it had not been determined whether additional transmission facilities would be required to satisfy the requests for transmission service.

The full Plan can also be found on SaskPower s web site at www.saskpower.com.

SaskPower 10-Year Transmission Development Plan

1.0 Introduction

The SaskPower 10-Year Transmission Development Plan provides a discussion of SaskPower s anticipated transmission developments for the period 2002-2011.

Starting with this first Plan, SaskPower will update this document on an annual basis.

The preparation and publication of this 10-Year Transmission Development Plan is in keeping with SaskPower s commitment to provide clear and open communication to our customers across Saskatchewan.

When reviewing the contents of SaskPower s 10-Year Transmission Development Plan, it is important to keep the following considerations in mind:

- Customer service needs and resulting projects may arise that are not included.
- SaskPower may be in discussions with customers who do not wish to have the discussions prematurely disclosed because of the potential to compromise commercial or competitive interests.

1.1 Context

The impetus for preparing a SaskPower Transmission Development Plan is found in the work of the Transmission Line Routing Review Panel, established in June 2000. The Panel s mandate was to advise SaskPower on guidelines and practices to guide the routing of transmission lines on private and municipal land in the surveyed portion of Saskatchewan.

The construction of transmission lines has become an increasingly challenging proposition for not only SaskPower, but also all electrical utilities across North America. Increased emphasis on environmental issues and public reviews regarding proposed transmission facilities has meant additional responsibilities for SaskPower.

When the Transmission Line Routing Review Panel was convened, its Final Report was envisioned as a guide to help SaskPower manage these changing expectations. The Panel recommendations regarding public consultation and benchmarking have become an important part of SaskPower s efforts to ensure that corporate guidelines and processes reflect current realities and best practices within the industry.

The publication of SaskPower s 10-Year Transmission Development Plan addresses issues identified by the Panel, as found in Recommendations #4 and #5 of its Final Report:

> #4 *The Panel recommends that SaskPower annually publish and communicate to stakeholders a 10-year forecast of load growth that assesses system reliability, identifies upcoming deficiencies, and outlines*

a general plan of improvements to address them.

#5 *The Panel recommends that SaskPower annually publish a capital investment plan that outlines the transmission improvements planned for the next 5 years. The plan should be detailed and comprehensive and include the reason for the investment; the location, probable type, and capacity; the estimated cost; and the expected dates of public review and commissioning.*

With publication of this Transmission Development Plan, SaskPower has fulfilled the commitment made in response to the Panel s Final Report of February 2001.

1.2 Document Scope

This document discusses planned facility additions along with anticipated but unbudgeted additions to SaskPower s transmission facilities and sub-transmission facilities. This document does not discuss planned additions to SaskPower s distribution system. This is consistent with the terms of reference for the Transmission Line Routing Review Panel and the definition of Transmission Facilities as used by the Panel.

For the purposes of this document, SaskPower differentiates between planned facilities and anticipated but unbudgeted facilities. Planned facilities are those facilities that have had funds, for the purposes of covering the cost of project construction, allocated in the capital budget which is part of SaskPower s five-year business plan. SaskPower, has also identified projects that may occur within the next five years, but are not currently included in its business plan document. These projects may have been left out of the plan because of their tentative nature, or because they may be driven by customer requirements and are still at the preliminary stages of discussion. SaskPower has also identified projects which are beyond the five-year business plan, but which are expected to occur based upon the 10-year load forecast and supply development requirements.

As a matter of clarification, transmission projects that are identified in SaskPower s five-year capital plan are not necessarily committed. Major projects that are included in the business plan are normally submitted on the basis of a preliminary assessment of need. These projects are still required to go through final technical studies and internal approval by SaskPower s Executive and Board (as dictated by the notional value of a project). During the internal review process, projects listed in the Business Plan may change because of the final technical studies, changes in the load forecast or changes in customer requirements.

2.0 Definition of SaskPower's Facilities

SaskPower s power line facilities associated with the delivery of electrical power from the source to the end user can be broken down into three general categories:

- Grid Transmission Facilities
- Sub-transmission Facilities
- Distribution Facilities

2.1 Grid Transmission Facilities

The North American Electric Reliability Council (NERC)[1] identifies the purpose of the grid transmission system or interconnected transmission system as follows[2]:

The interconnected transmission systems are the principal media for achieving reliable electric supply. They tie together the major electric system facilities, generation resources, and customer demand centers. These systems must be planned, designed, and constructed to operate reliably within thermal, voltage, and stability limits while achieving their major purposes. These purposes are to:

Deliver Electric Power to Areas of Customer Demand *Transmission systems provide for the integration of electric generation resources and electric system facilities to ensure the reliable delivery of electric power to continuously changing customer demands under a wide variety of system operating conditions.*

Provide Flexibility for Changing System Conditions *Transmission capacity must be available on the interconnected transmission systems to provide flexibility to handle the shift in facility loadings caused by the maintenance of generation and transmission equipment, the forced outages of such equipment, and a wide range of other system variable conditions, such as construction delays, higher than expected customer demands, and generating unit fuel shortages.*

Reduce Installed Generating Capacity *Transmission interconnections with neighboring electric systems allow for the sharing of generating capacity through diversity in customer demands and generator availability, thereby reducing investment in generation facilities.*

Allow Economic Exchange of Electric Power Among Systems *Transmission interconnections between systems, coupled with internal system transmission facilities, allow for the economic exchange of electric power among all systems and industry participants. Such economy transfers help to reduce the cost of electric supply to customers.*

SaskPower s grid transmission system (Figure #1, pg. 6) consists of the interconnected power lines and associated equipment involved in the transfer of

1 The North American Electric Reliability Council (NERC) is a not-for-profit corporation. NERC's members are the ten Regional Transmission Councils. The members of these Regional Councils come from all segments of the electric industry: investor-owned utilities; federal power agencies; rural electric cooperatives; state, municipal and provincial utilities; independent power producers; power marketers; and end-use customers. These entities account for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico.
Since its formation in 1968, NERC has operated as a voluntary organization to promote bulk electric system (transmission system) reliability and security

2 NERC Planning Standards document, September 1997, page 7

electric energy between major points of supply and major points of delivery. By definition, grid transmission lines always originate and terminate at switching stations. The switching station may be associated with a supply point (connection of a power plant) or load points where the transmission voltage is stepped down to a voltage suitable for use on the sub-transmission or distribution system. The transmission system includes the facilities associated with the bulk transfer of electric energy between Saskatchewan and Alberta, Manitoba and North Dakota. The grid transmission lines in Saskatchewan generally operate at voltages of 230,000 volts (230 kV[3]) or 138,000 volts (138 kV). SaskPower has grid transmission lines in northern Saskatchewan that operate at 110,000 volts and 115,000 volts. Power flow levels on individual grid transmission lines operating at 230,000 volts can exceed 300,000 kW[4].

2.2 Sub-Transmision Facilities

The sub-transmission system (Figure #2 pg. 7) consists of the power lines that take electrical energy from switching stations and deliver it directly to larger customers, or to smaller load centers (sub-stations) in urban and rural areas where it is transformed for delivery onto SaskPower s distribution system. The majority of SaskPower s sub-transmission system operates at 72,000 volts (72 kV); however, there are some sub-transmission facilities operating at 138,000 volts (138 kV). SaskPower has approximately 4,400 km of 72 kV sub-transmission power lines. Power flow levels on individual sub-transmission lines are normally below 30,000 kW. The exception to this is the shorter sub-transmission lines that supply the highly concentrated loads in urban areas. The loading on these sub-transmission lines can exceed 100,000 kW.

2.3 Distribution Facilities

The distribution system delivers electrical energy from SaskPower s sub-stations to the majority of SaskPower s customers. The distribution system consists of power lines in the range of 25,000 volts down to 4,160 volts, and secondary distribution, which operates at voltages below 4,160 volts. The majority of SaskPower s distribution system is a 25,000 volt (three phase — three wire) / 14,400 volt (single phase — single wire) system. SaskPower has approximately 22,800 km of overhead 25,000 volt powerline, 700 km of underground 25,000 volt powerline, 72,400 km of overhead 14,400 volt powerline and 42,900 km of underground 14,400 volt powerline. The majority of SaskPower s distribution system, in terms of the length of facilities, is associated with the supply of loads in rural areas. Farm and rural residence loads are generally supplied directly from the 14,400 volt system via individual transformers at the customer s site which drop the voltage to the customer s utilization voltage. In urban areas, the

3 kV is an abbreviation meaning thousands of volts

4 kW is an abbreviation meaning thousands of watts. Watt is a measure of electrical power. The term electrical power is used interchangeably with electrical demand.

distribution system includes secondary voltage power lines operating at 120/240 volts (generally located in alleys or in easements) which are used to collect the loads of a number of individual customers in a city block for supply from an individual transformer. The power transfer on individual 25,000 volt power lines in rural areas is typically in the order of 3,000 kW. However, the loading on individual 25,000 volt power lines that supply highly concentrated loads in urban areas can exceed 8,000 kW.

3.0 Transmission System Performance Criteria

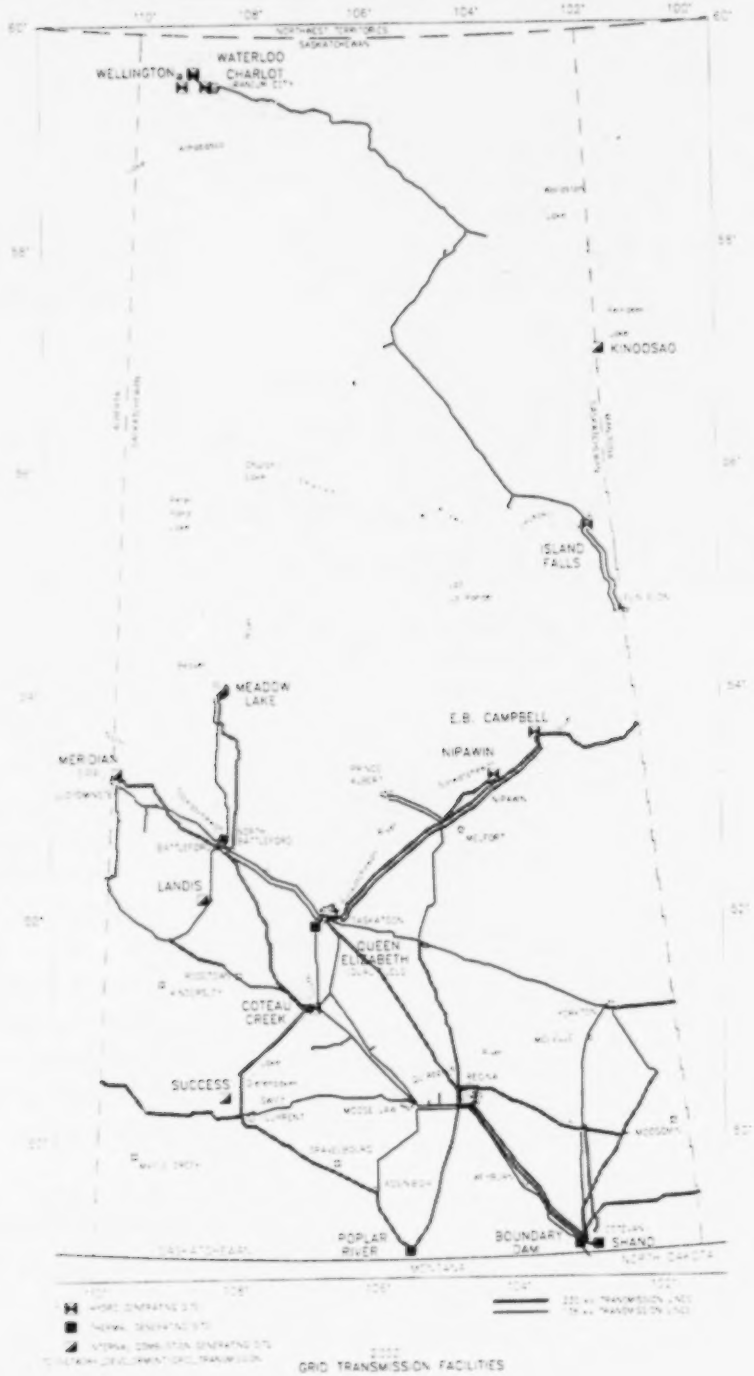
SaskPower plans additions to its grid transmission and sub-transmission facilities in an attempt to ensure that they will continue to operate in a satisfactory manner in the future as the requirements imposed on the system changes. SaskPower uses a number of criteria to assess what constitutes satisfactory performance. These criteria can be placed into the following general categories:

- adequacy - the ability of the electric system, with all facilities in service, to supply the aggregate electrical demand and energy requirements of customers at all times, while maintaining adequate system voltages and without incurring apparatus overloads, and taking into account scheduled and reasonably expected unscheduled outages of system elements,
- security (applies to the interconnected grid transmission system) — refers to the ability of the interconnected transmission system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system transmission elements without causing extended loss of load or uncontrolled shut down of the power system,
- reliability- reliability is an all encompassing description. As used by NERC, it includes an assessment of the adequacy and security of the transmission system. SaskPower uses the term reliability as a term distinct from adequacy and security, when discussing the performance of the sub-transmission system where the NERC concepts of system security do not apply. When assessing the reliability of the sub-transmission system, SaskPower s objective is to ensure that the frequency and duration of power outages to customers is kept to an acceptable level, and
- cost effectiveness - ensuring that the total annual cost of the transmission system (including capital costs, transmission loss costs and maintenance costs) is minimized.

Adequacy and security criteria receive equivalent consideration when assessing the need for grid transmission facility additions. As noted, security criteria are not applicable to the sub-transmission system. Adequacy and reliability are the

Figure #1

2002 Grid Transmission Facilities



GRID TRANSMISSION FACILITIES

Figure #2

2002 72kV Subtransmission Facilities

most important criteria in assessing the need for sub-transmission facilities. Cost effectiveness by itself rarely becomes a driver for new transmission facilities. Cost criteria come in to play when determining such items as the most effective conductor size for a transmission line, or when evaluating the merits of one particular reinforcement scheme against another scheme.

3.1 Transmission System Adequacy

The flow of electric power over transmission lines generally causes the voltage at the receiving end of the power line to be lower than the voltage at the sending end of the power line. SaskPower s objective is to maintain the level of the voltage at delivery points high enough such that it is able to meet the Canadian Standard Association (CSA) standard Preferred Voltage Levels for AC Systems 0 to 50,000 V (CAN3-C235-83). This generally requires that the voltage at delivery points on the sub-transmission system not be allowed to drop below 90% of nominal voltage. Voltages at source points on the grid transmission system normally operate at nominal or greater because of transmission security considerations and a desire to minimize losses on the transmission system.

In addition to maintaining adequate voltages, it is also SaskPower s objective to ensure that its facilities are capable of delivering power without exceeding the ratings of the transmission equipment. Equipment limits are normally determined by the ability of the equipment to withstand the increasing internal temperature rise resulting from increased loading (elevated temperatures lead to accelerated aging of insulation and eventual insulation breakdown). In the case of transmission lines, ratings may also be set by the available clearance below the energized conductor. As the level of power flow on a transmission line increases, the conductor heats up. The thermal expansion resulting from the higher operating temperature of the conductor causes it to lengthen, with the result that it droops more between support structures. This results in a reduction in the clearance between the conductor and ground. The CSA establishes standards for the minimum acceptable ground clearance.

As power flow increases on transmission facilities, it may be necessary to upgrade or add additional facilities in order to maintain adequate voltages and maintain equipment within acceptable loading levels.

3.2 Transmission System Security

SaskPower s grid transmission system experiences regular disturbances, which can cause a forced outage of a transmission line or other transmission components. The most significant cause of transmission line forced outages is adverse weather (greater than 45%.)[5] SaskPower designs its interconnected grid system so that it can tolerate a single element outage (a single grid line or grid

5 Annual average for the 10-year period from 1992-2001

transformer) without seriously degrading customer service reliability. The factors SaskPower takes into consideration in evaluating the security of its transmission grid are the ability to withstand the loss of any single transmission element without causing:

- ¥ cascade tripping of any remaining transmission lines,
- ¥ cascade tripping of generator units due to real or reactive power overloads,
- ¥ the transmission system to become dynamically unstable, or
- ¥ incurring system voltage collapse.

The security criteria for SaskPower s grid transmission facilities are largely consistent with the NERC system adequacy and security requirements. NERC s planning standards for system adequacy and security are as follows [6]:

1A S1. The interconnected transmission systems shall be planned, designed, and constructed such that with all transmission facilities in service and with normal (pre-contingency) operating procedures in effect, the network can deliver generator unit output to meet projected customer demands and provide contracted firm (non-recallable reserved) transmission services, at all demand levels, under the conditions defined in Category A of Table I (attached).

1A S2 The interconnected transmission systems shall be planned, designed, and constructed such that the network can be operated to supply projected customer demands and contracted firm (non-recallable reserved) transmission services, at all demand levels, under the conditions of the contingencies as defined in Category B of Table I (attached).

The transmission systems also shall be capable of accommodating planned bulk electric equipment maintenance outages and continuing to operate within thermal, voltage, and stability limits under the conditions of the contingencies as defined in Category B of Table I (attached).

1A S3. The interconnected transmission systems shall be planned, designed, and constructed such that the network can be operated to supply projected customer demands and contracted firm (non-recallable reserved) transmission services, at all demand levels, under the conditions of the contingencies as defined in Category C of Table I (attached). The controlled interruption of customer demand, the planned removal of generators, or the curtailment of firm (non-

6 NERC Planning Standards document, September 1997, page 9 -10

recallable reserved) power transfers may be necessary to meet this standard.

The transmission systems also shall be capable of accommodating planned bulk electric equipment maintenance outages and continuing to operate within thermal, voltage, and stability limits under the conditions of the contingencies as defined in Category C of Table I (attached).

1A S4. The interconnected transmission systems shall be evaluated for the risks and consequences of a number of each of the extreme contingencies that are listed under Category D of Table I (attached).

In NERC standard IA S2, Category B conditions include the loss of a single element such as a generator, transmission circuit or transformer. The NERC standard 1A S2 criteria requires that the loss of this element be withstood whether it be induced by a single line to ground fault or a three-phase line to ground fault. The significance of this is that the three-phase fault imposes a much more severe disturbance on the power system than the single line to ground fault; however, three-phase faults are extremely rare. The 10-year average for all grid transmission line forced outages is 211[7] per year for SaskPower s system. However, the average for three-phase faults on its grid transmission system is only five per year. Because of their low probability, SaskPower has not explicitly designed its transmission system to provide service without interruption following a three-phase fault. As a result, not all the elements of SaskPower s existing transmission system are compliant with the NERC category B requirement for withstanding three phase faults. SaskPower is generally planning its future additions to the transmission system such that they follow the NERC planning standards for adequacy. SaskPower is currently reviewing options for compliance on existing facilities.

SaskPower is generally in compliance with the performance requirements of NERC standard 1A S3; however, it does have some non-conformance issues with respect to the systems it uses for controlling the loss of load.

3.3 Transmission System Reliability

As noted, SaskPower uses the term reliability, as a term distinct from adequacy and security, when discussing the performance of the sub-transmission system. The concepts of system security espoused by the NERC planning standards, which require the ability to maintain service following the loss of one or two elements, do not apply to the sub-transmission system. The majority of the sub-transmission system consists of serial elements with only one point of supply. There are no parallel paths connected over which power can flow in the event that

7 For the 10-year period from 1992 to 2001

one of the serial elements fails.

When assessing the reliability of the sub-transmission system, SaskPower s objective is to ensure that the frequency and duration of power outages to customers is kept to an acceptable level. SaskPower does not currently set specific targets for sub-transmission system outage frequency and duration, in part because outage frequency is affected by the length of the sub-transmission line (longer lines will be have a greater possibility of weather induced outages due to their greater exposure). The 10-year average for SaskPower s average interruption frequency per sub transmission line, due to all causes, is 4.8[8] interruptions per year. The 10-year average annual interruption duration per sub-transmission line is 128[9] minutes per year. When particular lines have significant deviation from the average, SaskPower assesses remedial action, such as it is carrying out on the PA8 and ML3 72 kV sub-transmission lines.

The reliability of the transmission lines that extend north from the Island Falls Switching Station to Rabbit Lake and Uranium City are not assessed on the same basis as southern sub-transmission lines. These power lines are built in remote areas, through the Canadian Shield, which does not permit effective grounding and lightning protection on the power lines. As a result, these power lines experience a very high frequency of lightning induced outages. Restoration times can be long because of the length of the system, complexity of the system, and access issues in the event of permanent equipment damage. These power lines were built for the express purpose of providing electrical service to northern mine sites and the limitations imposed by the location of the facilities was recognized in the supply arrangements that were negotiated with the customers.

3.4 Cost Effectiveness of the Transmission System

The flow of electrical power over a transmission element results in parasitic power and energy loss due to the resistance of the element. This energy loss manifests itself as heating of the transmission element. At peak load, the parasitic losses on SaskPower s grid transmission system use up about 5% of the power that is delivered from generation sources.

Parasitic losses can be reduced by adding additional transmission circuits to reduce the magnitude of flows on individual elements, raising the operating voltage of transmission lines, or increasing the size of transmission conductors.

The reduced energy losses represent a cost saving to SaskPower since less fuel is required to serve the loads. Also, the reduction in losses results in a lower overall system instantaneous power demand which reduces the amount of generation capacity that is required to serve the load, which represents a further capital cost saving.

8 For the 10-year period from 1992-2001
9 For the 10-year period from 1992-2001

4.0 Major Drivers of Need for New Transmission Facilities

Additions to the transmission system are normally required because of an expected violation of SaskPower s performance criteria. Violation of system adequacy, in particular the ability to maintain satisfactory voltage, is the performance criteria that most often drives requirements for new transmission or sub-transmission facilities. SaskPower checks for violations of its performance criteria using analytical computer models. Violations of the performance criteria predicted by the models usually results from forecast increases in power flow over transmission or sub-transmission facilities. The major drivers contributing to increased power flows include:

- Growth of general provincial load,
- Connection of new generation,
- Connection of new large industrial loads, and
- Increased utilization of the transmission system as a result of SaskPower s Open Access Transmission Tariff

Other factors, which are unrelated to increased power transfers, but may result in a requirement for new transmission include:

- Aging infrastructure, and
- Compliance with the NERC reliability standards

A general discussion of each of these drivers follows.

4.1 Load Growth

SaskPower generates two load forecasts; the Corporate load forecast and the Regional load forecast. The Corporate forecast provides an end-use based forecast of the total annual domestic electrical energy requirements that SaskPower will have to supply for the next 10 years. The Regional Load Forecast provides a breakdown of the expected annual peak demand [10] and annual energy usage at every major delivery point (switching station or large industrial customer) that is connected to SaskPower s transmission system.

4.1.1 Corporate 10-Year Load Forecast

The load forecast is developed on an annual basis in order to determine the energy requirements and peak demand for SaskPower s customers in the province of Saskatchewan. This forecast forms the basis for capacity additions, maintenance schedules, power plant operations, fuel budgets, operation budgets and Corporate revenue.

The 2001 Load Forecast was prepared for the years 2001-2011 using inputs from the 2001 SaskPower Economic Forecast, historical energy sales, and individual customer forecasts. This forecast is a compilation of energy sales forecasts for Key Account, Oilfield, Commercial, Residential, Farm, and Reseller customers. The forecast also includes projections for

10 DEMAND — The rate at which electrical energy is delivered to or used by a system or part of a system at a given instant or averaged over any designated interval of time. Demand is generally expressed in kilowatts (kW) or megawatts (MW). The term electrical power is used interchangeably with electrical demand.

internal corporate use, system losses and unaccounted energy use, and non-grid energy use.

Weather can have a significant impact on the amount of electricity used by Residential, Commercial, Farm, and Reseller customers. Due to this weather sensitivity, average daily weather conditions for the last 30 years are assumed throughout the forecast horizon.

The 2001 Load Forecast predicts an increase in the total system energy requirements of 3,082 GW.h[11] over the next 10 years. This increase from 18,179 GW.h in 2001 to 21,261 GW.h in 2011 translates into an average annual growth rate of 1.6% (Figure #3, pg. 14). The historical average annual growth rate was 3.2% for the years 1990-2000.

The system peak load is expected to increase by 475 MW from 2,882 MW[12] in 2001 to 3,357 MW in 2011(Figure #4, pg. 14). This equates to an average annual growth rate of 1.5%. The demand at time of system peak grew at an average annual rate of 2.0% for the years 1990-2000.

A report documenting the methodology behind the derivation of the forecast data, the assumptions and the forecast results for the 2001-2011 timeframe, is available from SaskPower on request.

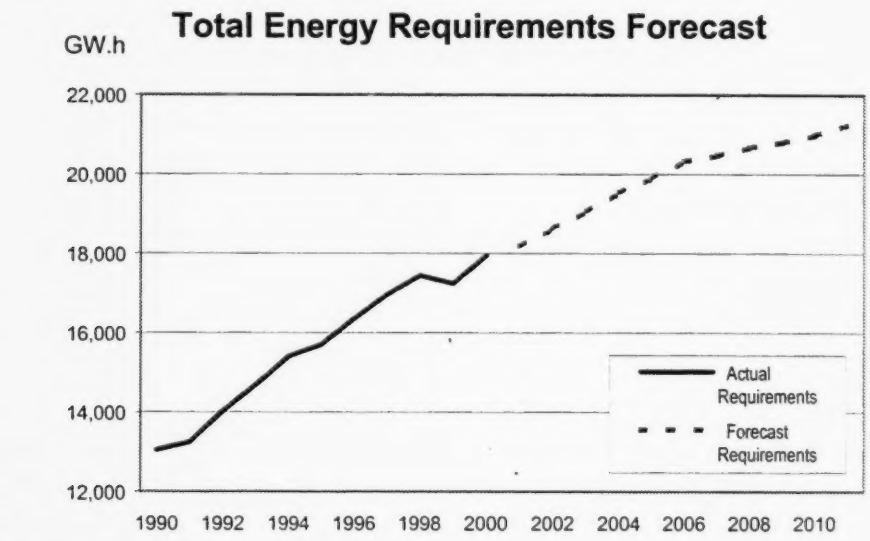
4.1.2 Regional Load Forecast

The Corporate forecast is useful for making decisions about future energy and capacity supply requirements for the province as a whole. The Corporate forecast is not particularly useful for forecasting future requirements for the transmission system since it does not identify the location of load growth within the province. As an example, the Corporate forecast will provide an estimate of total oilfield load growth within the province, but will not be specific as to which oilfields will experience the growth. To address this deficiency, SaskPower creates a separate load forecast report called the Regional Load Forecast.

The Regional Load Forecast is developed on an annual basis in order to determine the energy requirements and peak demand for SaskPower s major delivery points on the transmission system. The Regional Load Forecast provides the expected annual peak demand and annual energy usage at every major delivery point (switching station or large industrial customer) that is connected to SaskPower s transmission system. The forecast for each delivery point has been developed based on the historical relationship between the peak demand at the delivery point and the aggregate demand for the whole system. Information about the historical relationship between delivery point demands and the system demand is derived from SaskPower s real time monitoring system for the grid and its interval metering system for grid connected customers.

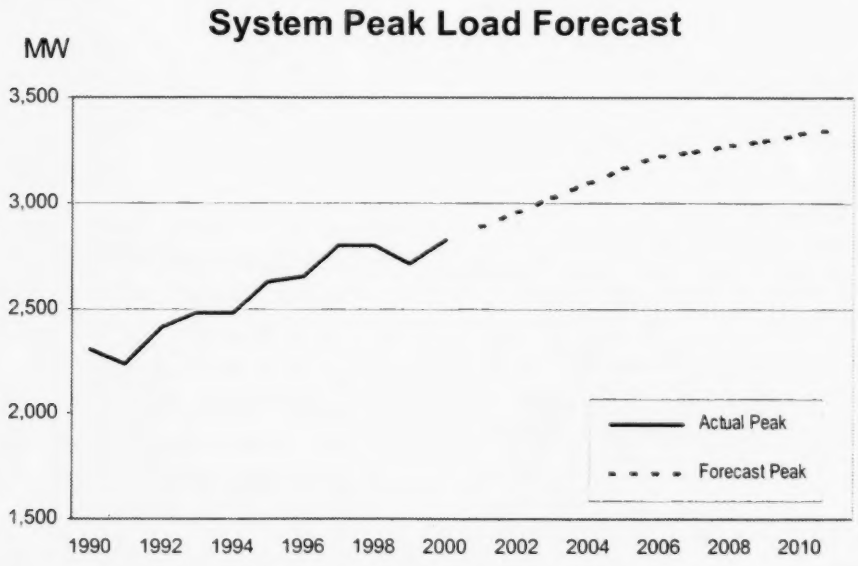
11 GW.h means Giga watt-hours. Electrical energy is measured in units of watt-hours. A giga watt-hour is 1,000,000,000 watt-hours.
12 MW is an abbreviation meaning millions of watts.

Figure #3



Energy Requirements = Energy Sales + Losses

Figure #4



The Regional Forecast provides an indication as to where the load increases are occurring. An increase in the peak demand is normally the biggest factor in driving the requirement for reinforcement of the transmission system. This forecast forms the primary basis for determining the requirements for reinforcing the transmission system to supply increasing customer demand at the various bulk electric system delivery points on SaskPower s transmission system.

4.2 Connection of New Generation

New generation facilities require interconnection with SaskPower s system if the generation is going to be used to supply energy to SaskPower customers or for export out of the province. In general, generators up to about 1,000 kW in size can be incorporated into the distribution system. Any generators above 5,000 kW will almost certainly require connection into the sub-transmission or transmission system.

Connection of major generation developments such as a hydro project or a coal fired generation project, which are typically remote from load centers, requires the addition of significant transmission facilities. Generation developments, which are based around co-generation at existing industrial loads, can quite often be integrated with minimal amounts of transmission. This is especially true if the load sites are close to major provincial load centers, or if the effect of the generation is to reduce, or reverse flows on existing transmission facilities.

Integration of wind power generation projects presents an unusual problem. Individual wind turbines tend to be less than 1,000 kW in size; however, because the wind resource is very site specific, the practice is to develop large clusters of machines at individual sites or wind power projects . Integration of these wind power projects usually requires the construction of some transmission or sub-transmission facilities. This comment also applies to so called smaller distribution connected generation technologies if a large number of these generation units are clustered at a particular location.

For details on the technical requirements associated with the connection of generation to SaskPower s system, refer to the documents Non-Utility Generation Interconnection Requirements at Voltages 25 kV and Below and Non-Utility Generation Interconnection Requirements at Voltages 72 kV and Above which are available at www.saskpower.com.

SaskPower posts an interconnection queue on the public portion of its OASIS[13] web site (http://mapp.oasis.mapp.org/documents/SPC/spc_info_public.htm). The purpose of the interconnection queue is to facilitate the non discrimination provisions in SaskPower s Standard of Conduct[14] by making public all requests that have been made for a study to evaluate an interconnection with SaskPower s

13 OASIS - OASIS stands for Open Access Same Time Information System and is the internet based system which provides information related to the provision of transmission service under SaskPower s Open Access Transmission Tariff (OATT) along with providing the means for eligible customers to submit requests for transmission service under the SaskPower s OATT.

transmission system. Interconnection study requests are typically for generators, but may also be submitted by entities that are requesting the interconnection of transmission facilities with SaskPower s system. The queue lists the date of the request, the size of the interconnection, the location of the interconnection and the status of the request. Due to confidentiality issues, the queue does not identify the requestor; however, all requests, including those submitted by SaskPower for the supply of domestic load, and requests submitted by SaskPower s affiliates NorthPoint Energy Solutions and SaskPower International, are listed in the queue. As of 2002 March 31, there were no requests for studies for interconnection of new generation projects with SaskPower s transmission system.

4.2.1 New SaskPower Generation Developments

Prior to 1990, SaskPower did all of its own planning and development in terms of new generation resources required to supply increasing domestic load. Given this approach to supply planning, SaskPower was able to develop a long-term view on where all major generation projects and associated transmission facilities were going to be located. In the mid-1990s, SaskPower changed its approach to supply development. SaskPower still continues planning in terms of identifying the quantity and timing for new generation developments, but it no longer acts as the exclusive developer of generation projects in the province for domestic supply. Examples of projects which have or are being built to supply SaskPower load but which are not under the direct ownership of SaskPower are the Meridian Cogeneration Project at Lloydminster, the SunBridge Wind Power Project near Gull Lake and the Cory Cogeneration Station near Saskatoon.

SaskPower is no longer acting as the only project developer in the province, and as such, it does not have an exclusive view on the location and associated transmission for all future generation developments in the province. Potential generation developers will take into consideration the location of resources, be it the availability of suitable hosts for economical cogeneration projects, or optimal wind power regimes. The amount that SaskPower is prepared to pay a potential developer for the supply of electrical energy is influenced by the cost of integrating that resource into SaskPower s system. Developers may select sites with the objective of minimizing the amount or cost of transmission required to integrate a particular generator site. SaskPower currently posts information (internal resource penalty factors) on its OASIS internet web site which allows potential developers to assess the impact of any potential generation site on transmission system losses.

At present, SaskPower has two new supply sources, the Cory Non-utility co-

14 Copies of the Standard of Conduct are available on SaskPower s OASIS web site

generation project and Queen Elizabeth Power Station Unit #1 repowering project. Both will be in service by year-end 2002. As a result, SaskPower s most recent review of its resource requirements has determined that major new supply developments for domestic load are not expected before 2008. This date is based upon SaskPower s current load forecast and is subject to revisions in the load forecast. In addition, SaskPower may be engaging in some small-scale generation developments prior to 2008 to facilitate specific programs such as GreenPower.

4.3 Connection of New Major Loads

Depending on the characteristics of the load, it may be possible to accommodate an individual customer load as large as 1,000 to 5,000 kW on the distribution system, if it is located in or near urban areas. Without special consideration, it is generally not possible to supply a load this large via the distribution system in rural areas. New loads greater that 5,000 kW will almost certainly require connection to the sub-transmission system or the transmission system. The choice of connection to the sub-transmission system or the transmission system will depend on the proximity of existing SaskPower facilities, the size (peak demand) of the load, characteristics of the load and the economics of the overall project. The latter factor tends to balance the fact that the higher transmission voltages tend to have lower transmission losses and lower transmission rates, but the cost for the facilities to connect the load is higher. Depending on the loads peak demand and annual energy requirements, the rate and loss savings may or may not pay for the higher facilities cost.

4.4 SaskPower's Open Access Transmission Tariff (OATT)

In November of 2001, SaskPower posted an Open Access Transmission Tariff (OATT).

Under the provisions of SaskPower s OATT, eligible transmission customers can request transmission service from SaskPower which may require the construction of new transmission or sub-transmission facilities in Saskatchewan. This transmission service may, or may not be associated with the supply of load located within Saskatchewan. Under the provisions of its tariff, SaskPower provides equal treatment and consideration for all transmission whether it is being built by SaskPower for the supply of domestic load, or to satisfy a service request under the provisions of SaskPower s OATT.

Traditionally, generation projects were developed exclusively by SaskPower for the purpose of supplying domestic load. Under SaskPower s Open Access Transmission Tariff (OATT), proponents interested in the development of generation projects for the purpose of supplying energy to entities other than SaskPower can request connection to the transmission system and service over

SaskPower s transmission system to deliver that energy to the desired location. SaskPower may be required to build transmission to integrate these projects, or to provide the transmission service required to facilitate the ultimate delivery of this energy. These projects may be driven by market conditions for electrical energy outside of Saskatchewan. Due to the volatility of some of these markets, project proponents tend to defer decisions on these projects to the last possible moment. As SaskPower receives requests for new interconnections to its transmission system, these requests are added to the Interconnection Study Queue, which is posted on the public portion of SaskPower s OASIS web site.

SaskPower has received a number of requests for transmission service under the provisions of its tariff. Some of these service requests exceed the transmission system transfer limits that are currently posted on SaskPower s OASIS site. Analytical studies are currently under way to assess the requirements associated with servicing these requests. The first group of studies has yet to be completed, and as such, it is not known whether any transmission facilities will have to be added to service the requests. In addition, the transmission customers have to agree to the terms and conditions of the transmission service before any facilities would be built.

4.5 Aging Infrastructure

SaskPower currently has slightly over 13,000 circuit kilometers of transmission and sub-transmission power lines in service. In 1972, SaskPower had approximately 9,100 kilometers of transmission and sub-transmission power line in service. Without consideration of the small amount of sub-transmission facilities that have been removed from service since 1972, approximately 70% of SaskPower s transmission and sub-transmission facilities are in excess of 30 years of age. SaskPower has a large number of 138 kV transmission lines in service that date back to construction in the 1950s, which is the same timeframe for the construction of the majority of SaskPower s 72 kV sub-transmission system.

For accounting purposes, SaskPower currently uses a composite expected asset life of 45 years for transmission line assets. The expected asset life, and the current age of the majority of SaskPower s transmission line assets would suggest that SaskPower has an emerging issue associated with the replacement of aging transmission lines. The reality is that SaskPower engages in a program of continual monitoring of the condition of its transmission line assets. In the case of wood pole construction, deterioration of the poles due to rot at the ground line is normally the biggest problem. Where SaskPower detects pole deterioration, it carries out stubbing or replacement of the failing poles. SaskPower also checks line hardware for integrity and tightness.

SaskPower s older transmission lines have reached the point where they require regular inspection and a higher level of maintenance than a new transmission line. However, the cost of this annual inspection and maintenance is well below the cost of replacement. Due to the inspection and maintenance program, SaskPower s older transmission lines are not approaching the end of their useful life based upon their physical condition. Since 1987, all new major transmission and sub-transmission projects have been constructed with tubular steel instead of wood. To date, the tubular steel design has proven to require very low levels of maintenance.

Based upon the transmission line maintenance practices that SaskPower has engaged in, and the new steel designs that SaskPower has adopted, it is anticipated that there will be very little new transmission line construction required to address replacement of existing transmission lines solely due to age related deterioration. There may be some cases where some older transmission lines are exceeding their rating due to increased loading, and a decision has been made to replace them; however, this is an issue of transmission adequacy, not age.

There are a couple of locations where transmission line replacement is in part being precipitated by facility age and condition. There are a number of sub-transmission lines in north central Saskatchewan, among them PA8 and ML3, that were built with insulators known as pin-type insulators. These pin—type insulators have a design flaw called cement growth, which leads to the development of cracks in the porcelain insulator skirt and its subsequent failure. In the case of PA8 and ML3, because the power lines are also running into problems with voltage adequacy, a decision has been made to retire the lines and replace them with new facilities.

4.6 Compliance with NERC Reliability Standards

Since its formation in 1968, the North American Electric Reliability Council (NERC) has operated as a voluntary organization to promote bulk electric system (transmission system) reliability and security. In promoting electric system reliability and security, one of NERC s activities is the on-going development of operating policies and planning standards to ensure bulk electric system reliability. NERC has also been active in developing a process for measuring compliance with its operating policies and standards through the Regional Councils that constitute its membership.

NERC s mandate for ensuring security and reliability does not extend to setting standards for the sub-transmission system or the distribution system. Compliance with the operating policies and planning standards is not currently enforced through any federal or provincial regulations; however, the policies and standards are to some extent viewed as good utility

practice . Some of the regional transmission entities, which have established contractual agreements with their members, make compliance with the NERC policies and standards a condition of membership, which is established through the contractual membership agreements.

SaskPower is participating in the assessment of compliance with the NERC policies and standards being carried out by the Mid-continent Area Power Pool (MAPP), the Regional Council with which SaskPower is associated. Most of the compliance issues that have been identified are associated with documentation deficiencies that SaskPower is working to address. However, the NERC standards set out requirements that are more onerous than SaskPower s current performance criteria when it comes to withstanding certain types of forced outages on transmission equipment. SaskPower is aware that it may have some compliance issues related to the performance of the transmission system following the loss of particular components of its grid transmission system. These compliance issues are discussed in more detail in section 5.3. Addressing these performance deficiencies may require the construction of new transmission facilities.

Grid transmission reliability and security have always been historical drivers of transmission need in Saskatchewan. However, compliance with the specific requirements of NERC has not. SaskPower has yet to make a decision as to whether it is going to adopt full compliance with the NERC standards. This decision will in part be driven by the business issues associated with being part of the overall interconnected mid-continent transmission system of the United States and Canada, along with the cost of achieving full compliance.

5.0 Evaluation of Requirements for Transmission System Developments

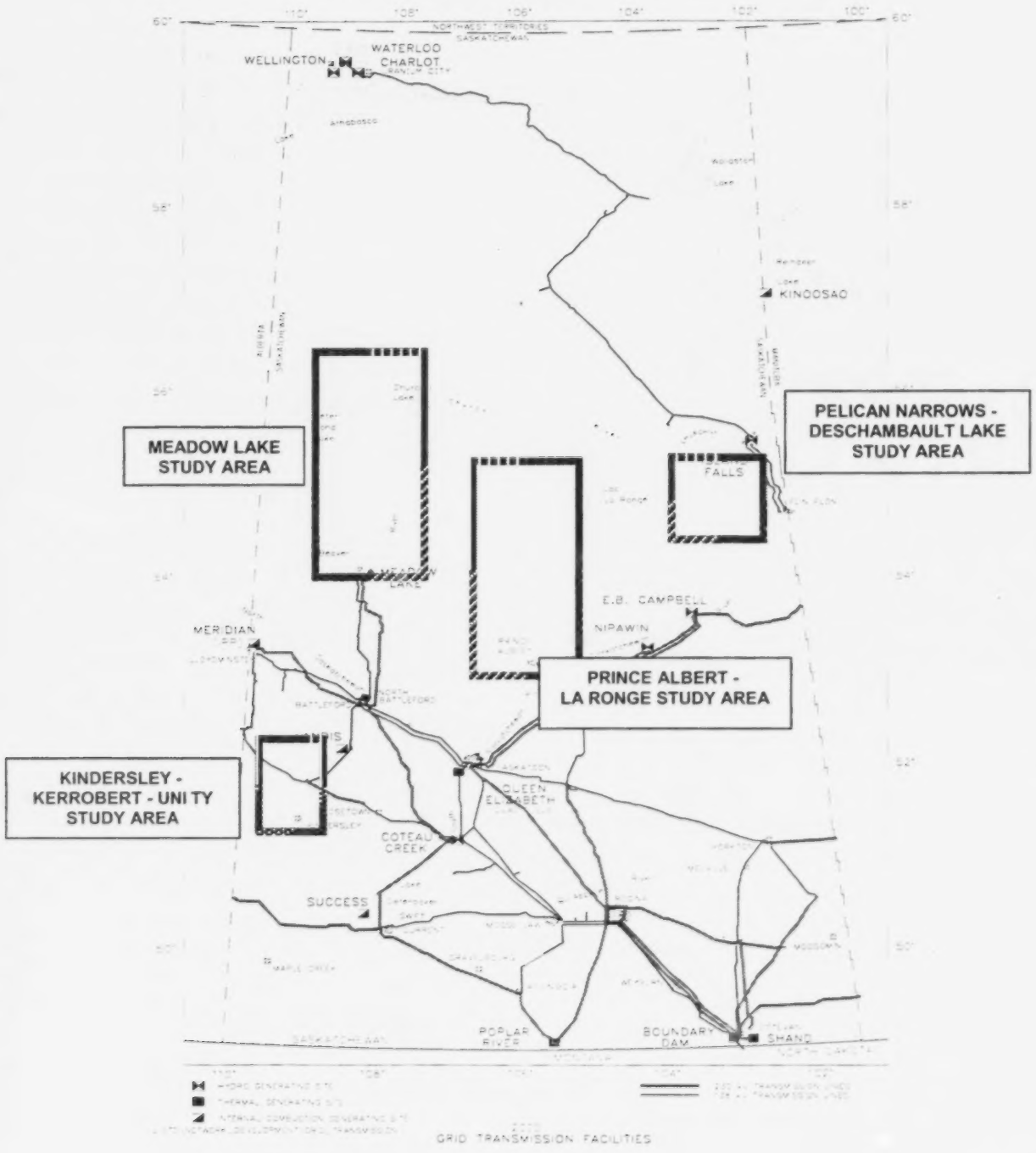
The evaluation of the requirement for transmission system reinforcement has been carried out by study areas within the province. The study areas are shown on Figure #5, (pg 21). The projects that fall within each study area are discussed. The status of each of the projects is indicated on the following basis:

- The project has been approved by SaskPower for construction (external approvals may still be pending),
- The project is in SaskPower s five-year capital plan,
- It is anticipated that the project could occur within the next five years, but the project is not currently in SaskPower s five-year capital plan, and
- It is anticipated that the project could occur within the next five to 10 years.

Appendix B provides a listing of all the

Figure #5

Provincial Study Areas



transmission projects that have been included in SaskPower s five-year capital plan. The five-year spending plan is updated quarterly. The plan attached as Appendix B was the most current version when this document was being prepared. In the interest of keeping the list relevant, not all transmission projects in SaskPower s five-year capital plan are listed in Appendix B. Projects that involve the communication, protection or control facilities associated with SaskPower s transmission system are not listed because they generally do not have any impact on the public. Projects that have expenditures over the five year period that total less than $50,000 have also been deleted from the list in the interests of brevity.

5.1 The Prince Albert and La Ronge Study Area

5.1.1 Reinforcement of the Supply to La Ronge

La Ronge, and most of the communities north of Prince Albert, are provided with electrical service via the PA8 power line. PA8 is a 256 km long, 72 kV power line fed from the Prince Albert Switching Station. It supplies power to four distribution substations north of Prince Albert; Spruce Home, Timber Cove, Weyakwin and La Ronge. The majority of the load on the line (about 65%) is at the La Ronge Substation located at the north end of the line.

The annual growth in peak load demand at La Ronge has averaged 5.8% since 1981, which is well above the provincial average of approximately 2.4% for the same period. This rapid growth has resulted in an ongoing problem associated with maintaining acceptable voltage at La Ronge. To date, this problem has been handled by adding 72 kV voltage regulators[15] to the line and installing capacitors at the various substations along the line. There are presently five, 72 kV voltage regulators in the PA8 power line.

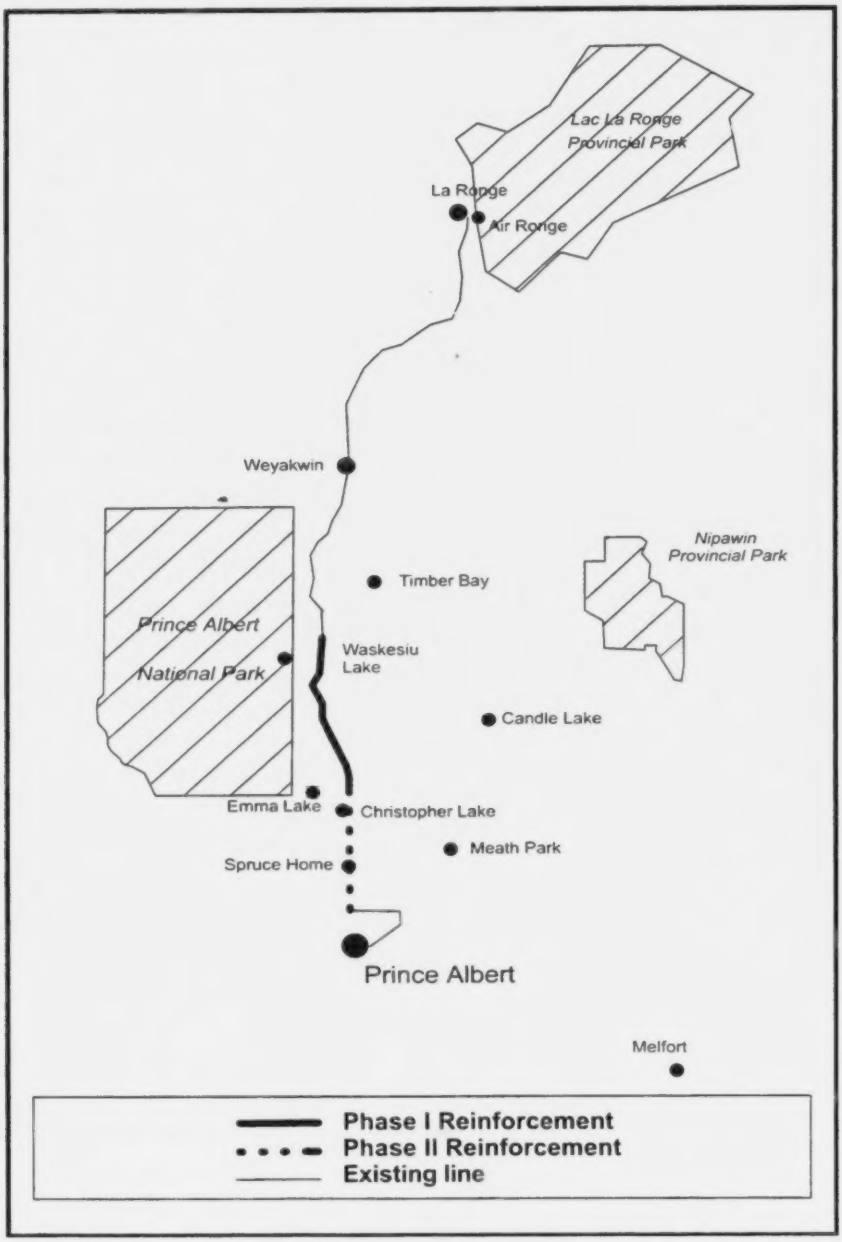
In addition to the voltage problems, as noted in Section 4.5, there have been insulator problems with sections of the PA8 power line, which compromise the reliability of service to La Ronge. The PA8 power line structures have also experienced pole failures as a result of damage to the poles caused by carpenter ants and woodpeckers.

The current solution of continuing to add 72 kV voltage regulators to the PA8 power line has led to deteriorating service quality for the customers supplied from PA8, the potential for customer equipment damage, and increasing costs for SaskPower and its customers. As the number of series voltage regulators in the line increases, coordination of the operation of the individual voltage regulators has also become increasingly difficult. As a result of the coordination problems, customers experience increased voltage fluctuations (shows up as flickering of lights). At peak load times, customers could ultimately experience extended periods of alternately high and low voltage leading to the

15 Voltage regulators are devices, connected in series with the power line, which boost the operating voltage along the power line. The purpose of the voltage regulator is to attempt to compensate for the voltage drop in a power line caused by the flow of line current through the impedance of the power line.

Figure #6

Prince Albert and LaRonge Study Area



potential for improper operation of, or damage to, customer equipment.

Because of the size of wire utilized on PA8, the existing power line incurs very high transmission line losses. At the time of peak load, approximately 35% of the power that is supplied into the line goes towards the supply of losses. These losses cost SaskPower and its customers approximately $1.5 million in 1999. The annual cost of supplying these losses will increase as the load supplied from the line increases.

SaskPower s plan for reinforcement of La Ronge is based upon a multi-stage replacement / reinforcement of the PA8 power line. The first stage of reinforcement provides for replacement of the portion of PA8 between Prince Albert and Timber Cove with a power line equipped with larger conductor and insulated for future 138 kV operation. This project has been approved and is in the process of being completed. The new section of power line will continue to operate at 72 kV until 2003. In 2003, the second stage of the reinforcement plan provides for conversion of the new line to 138 kV operation to supply a new 138-72 kV switching station to be built at Timber Cove. This project has been approved for construction. After completion of stage two, the portion of PA8 from Timber Cove to La Ronge will continue to operate at 72 kV.

A third stage of reinforcement, consisting of rebuilding the section of PA8 between Timber Cove and Tracy Road (approximately 74 km north of Timber Cove) is being studied. The tentative in-service date for stage three is 2004. The stage three project is in SaskPower s five-year capital plan.

The larger conductor and higher operating voltage will address the voltage control and transmission loss problems on PA8. The use of steel poles structures with modern composite insulators will improve service reliability.

5.1.2 Transmission Reinforcement for the Prince Albert Area

The loads in the immediate Prince Albert area, along with communities north (up to La Ronge) and northeast of Prince Albert, are supplied from a number of 72 kV and 138 kV distribution substations, which are all supplied from the Prince Albert Switching Station. The Prince Albert Switching Station, which is located just southwest of Prince Albert is, in turn, supplied via a double circuit 138 kV transmission line (designated B1P and B2P) from the Beatty Switching Station located west of Melfort. Based on current forecast peak demand growth in the Prince Albert area, reinforcement may be required by 2010 because of an inability to maintain satisfactory voltages at the Prince Albert Switching Station. However, the possibility of new industrial sites or expansion at existing industrial sites in the area will accelerate this requirement. It is expected that this reinforcement would be

provided via a new 230 kV transmission line extending between the Prince Albert Switching Station load supply point and the Beatty Switching Station.

It is anticipated that reinforcement could be required within the next five to 10 years.

There has been some discussion of the possibility of additional or new non-utility generation in the Prince Albert area. The addition of a moderate amount of generation in the Prince Albert area could possibly defer the need for system reinforcement. However, a very large generation project could accelerate the requirement for reinforcement to ensure a secure connection of the generation to the provincial grid.

5.2 The Meadow Lake Study Area

5.2.1 Reinforcement of the Supply to the Area North of Meadow Lake

The communities north of Meadow Lake are provided with electrical service via the ML3 power line. ML3 is a 300 km long, 72 kV power line fed from the Meadow Lake Switching Station. It supplies power to five distribution substations north of Meadow Lake; Dore Lake, Beauval, Ile a la Crosse, Buffalo Narrows and Turnor Lake, as well as to NorSask Forest Products, located just northeast of the town of Meadow Lake.

The annual growth in peak demand associated with the load on ML3 has averaged 4% since 1981, which is well above the provincial average of approximately 2.4% for the same period. This rapid growth has resulted in an ongoing problem associated with maintaining acceptable voltage at the communities along the line. To date, this problem has been handled by adding 72 kV voltage regulators to the line, rebuilding portions of the line and installing capacitors at the various substations along the line. There are presently two 72 kV voltage regulators in the power line.

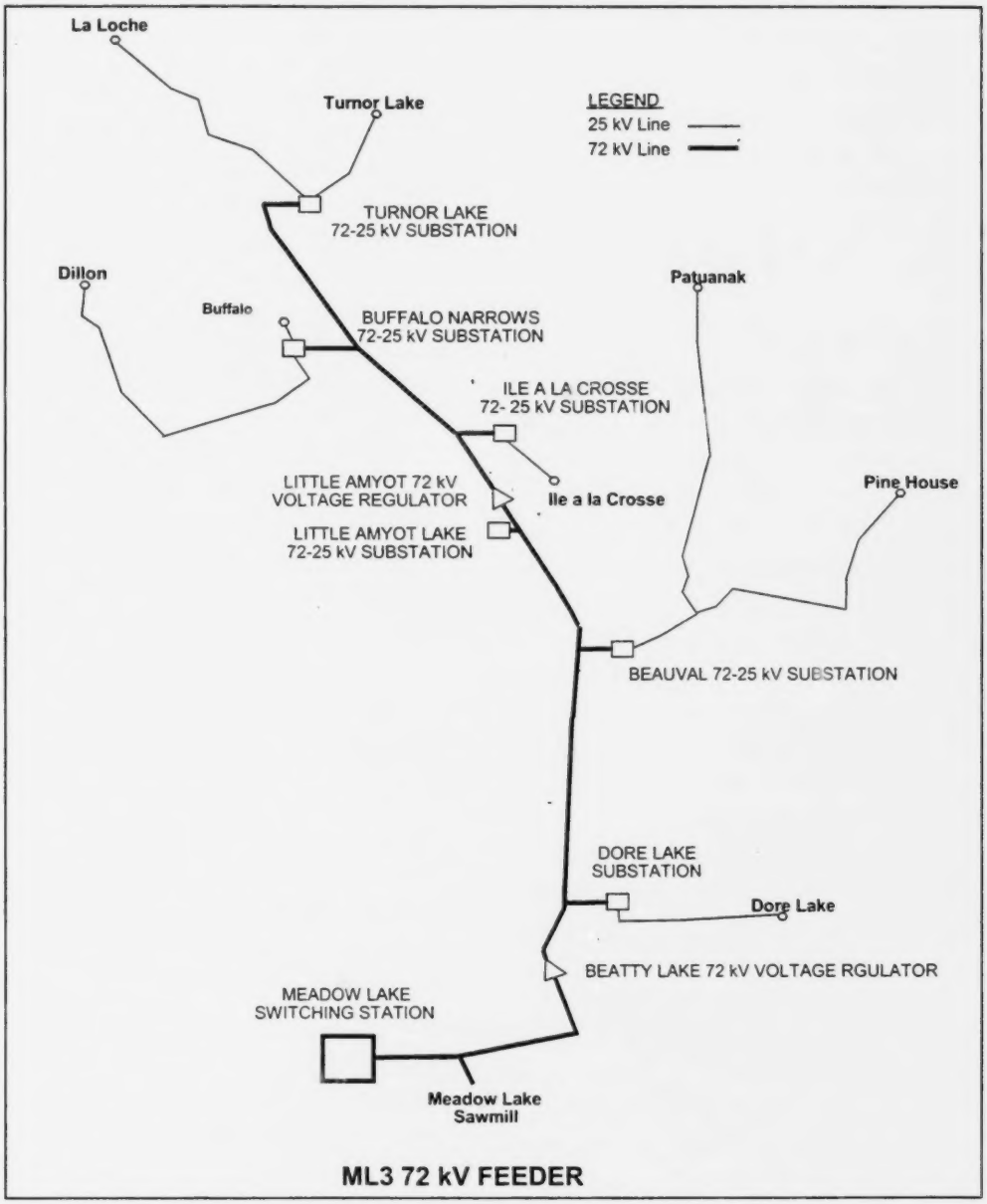
In addition to the voltage control problems, as noted in Section 4.5, there have been insulator problems on sections of the ML3 line, which compromise the reliability of service for the customers supplied from ML3. The ML3 line structures have also experienced pole failures as a result of damage to the poles caused by carpenter ants.

Due to the size of wire utilized on ML3, the existing power line incurs very high transmission line energy losses. At the time of peak load, approximately 23% of the power that is supplied into the line goes towards the supply of losses. These losses cost SaskPower and our customers approximately $1.2 million in 2001. The annual cost of supplying these losses will increase as the load supplied from the line increases.

SaskPower s reinforcement plan for the ML3 feeder is a staged development similar to the La Ronge reinforcement

Figure #7

Meadow Lake Study Area



plan. SaskPower has been replacing sections of ML3 with new power line equipped with much larger conductors, and insulated to allow future conversion to 138 kV operation. In March of 1999, the 37 km section of ML3 directly north of Beatty Lake was rebuilt and placed into service. In April of 2002 the replacement of the 30 km section of ML3 directly south of Beauval will be completed.

Several methods of addressing the future growth in demand, line loss and reliability issues have been explored. The results of the analyses carried out by SaskPower indicated that the continued multi-stage replacement of the ML3 powerline is the preferred reinforcement option. The third stage of reinforcement provides for the replacement of the 26 km section of ML3 from Green Lake to Beatty Lake in late 2002. The fourth stage reinforcement provides for replacement of the 22 km section of ML3 from Green Lake, west towards Meadow Lake by 2004. Further reinforcement or extension of the ML3 line will depend on the load growth in the area, the performance of the existing line and the operating limitations of the existing system. Current indications are that the next steps in reinforcement may consist of the conversion of the Meadow Lake to Beauval section of ML3 to 138 kV operation to supply a new 138-72 kV switching station to be located near Beauval. In addition, the significant increase in consumer load at La Loche may require the extension of ML3 from its current northern terminus of Turnor Lake to La Loche.

The third stage of replacement of ML3 has been approved. The fourth stage of replacement of ML3 is in SaskPower s five-year capital plan. Conversion of ML3 to 138 kV operation and extension of 72 kV to La Loche are anticipated to occur within the next five to 10 years.

5.2.2 Interconnection of a New OSB Plant Near Meadow Lake

To provide process power to the proposed new Tolko Oriented Strand Board (OSB) plant, near Meadow Lake, a new 7.2km, 230 kV transmission line will be required. This line will tap off of the existing BR11 230 kV transmission line. By tapping off of an existing line, the required new transmission line length is minimized.

The OSB plant is expected to be in service by the end of 2003. The project is in SaskPower s five-year capital plan. Preliminary engineering and line routing work has been approved.

5.2.3 Transmission Grid Reinforcement for the Meadow Lake Area

The consumer load in the immediate Meadow Lake area, and the load for all of the communities north of Meadow Lake, is supplied from a number of 72 kV distribution substations, which are all supplied from the Meadow Lake Switching Station. The Meadow Lake Switching Station is, in turn, supplied via a single 138 kV transmission line from the

Brada Switching Station near North Battleford. The Meadow Lake Switching Station is also connected to the Meadow Lake Power Station, which has a single 46 MW gas turbine generator.

As noted in Section 5, SaskPower plans facilities so that we can continue to supply the entire load in the event of the failure of a single piece of equipment. In the case of the supply to Meadow Lake, the critical element for supply reliability is the single 138-72 kV transformer at the Meadow Lake Switching Station, which serves the entire load supplied from the Switching Station. SaskPower s plans were that in the event of failure of this transformer, we would run the Meadow Lake generator to supply this load. Increases in the peak demand associated with the load in the area supplied from the Meadow Lake Switching Station mean that the Meadow Lake generator is no longer large enough to supply the Meadow Lake load in the event that the 138-72 kV transformer fails.

The load growth in the Meadow Lake area has also created the potential for problems with maintaining satisfactory voltages at the Meadow Lake Switching Station. Due to relatively high forced outage rates for peaking gas turbine generators like the Meadow Lake unit, SaskPower does not rely on the operation of these units to maintain service unless there is more than one unit. Based upon current load forecasts, SaskPower predicts that by the winter of 2002 — 2003, the voltage at the Meadow Lake Switching Station will drop to unacceptable levels during peak load periods if the Meadow Lake generator is out of service.

SaskPower is evaluating a number of options for addressing the 138-72 kV transformer capacity problem and the voltage support problem at Meadow Lake. SaskPower could address the voltage support problem by installing reactive compensation equipment in the Meadow Lake Switching Station, or reinforcing the Meadow Lake Switching Station via connection to the 230 kV transmission line (BR11) from the Brada Switching Station which supplies the Millar Western Pulp Mill northeast of Meadow Lake. Although these lines cross, at present there is no interconnection between the 230 kV and 138 kV lines. Reinforcement via connection to the 230 kV transmission line could be accomplished via the construction of a 230-138 kV switching station at the point where the 230 kV line crosses the 138 kV line. This would minimize the amount of new 230 kV transmission line construction, but would require the construction of a new switching station at that location. This alternative would still require additional 138-72 kV transformer capacity at the Meadow Lake Switching Station, which might require some expansion of the existing property. Another possible option is to create a new 230-72 kV switching station where the 230 kV transmission line crosses the ML3 72 kV transmission line which is supplied out of the Meadow Lake

Switching Station. This again would minimize the amount of new 230 kV transmission line construction, but would require the construction of a new switching station at that location. This alternative would also address the requirement for additional new transformation capacity at the 72 kV level. SaskPower has not selected its preferred reinforcement alternative.

The project is in SaskPower s five-year capital plan.

5.3 The Pelican Narrows – Deschambault Lake Study Area

5.3.1 Supply Reinforcement for Pelican Narrows – Deschambault Lake

The communities of Pelican Narrows, Jan Lake, Deschambault Lake and Sandy Bay are presently served by a 190 km long, 25 kV line extending from a 110-25 kV substation at the Island Falls Switching Station. The line was constructed in the 1980s in order to connect these communities to the SaskPower grid and to enable SaskPower to decommission the diesel plants that had previously served them. The combined load of these communities was initially quite small (less than 2 MW), but has since grown substantially. Over the past two years the peak demand has increased by more than 10% annually and is now approximately 6.9 MW. The load in this area is expected to continue to grow at a rate of more than 5% for the foreseeable future, due to the population growth in the area, combined with the fact that these communities have decided to install electric heat in all new and renovated homes. Prior to 2001, propane had been used for home and water heating.

The high winter load levels have created protection coordination problems and have forced SaskPower to install five sets of 25 kV voltage regulators in the line to Deschambault Lake. SaskPower typically tries to limit the number of voltage regulators in series in a 25 kV line to no more than three sets.

In order to accommodate the growing load in this area, SaskPower is evaluating the constructing of a 110 / 138 kV transmission line between the Island Falls Switching Station and the Village of Pelican Narrows which would be used to supply a new 110-25 kV distribution substation near Pelican Narrows. The addition of this line would allow SaskPower to remove three of the five sets of 25 kV voltage regulators, correct the protection coordination problems, reduce the line losses, improve the reliability of the electrical service in the area and accommodate future load growth. The new line and substation may also be able to accommodate the proposed sawmill developments in the area, depending on their exact location and load characteristics.

The project is in SaskPower s five-year capital plan.

5.4 The Kindersley – Kerrobert – Unity Study Area

The loads in the Kindersley, Kerrobert and Unity area are supplied out of the Ermine Switching Station which is located just southeast of Kerrobert. The Kerrobert, Luseland and Unity 72 kV substations are supplied out of Ermine on the ER3 72 kV feeder. The Coleville and Kindersley 72-25 kV substations are supplied out of Ermine on the S1E 72 kV feeder. The Ermine Switching Station is in turn, supplied via three 138 kV transmission lines designated L2E, E1L and C1E. The L2E and E1L lines extend south from Lloydminster and North Battleford, and the C1E line extends west from Coteau Creek.

5.4.1 Supply Reinforcement for the Area West of Kindersley

The oilfields, in the Marengo area to the west of Kindersley, are presently served by a 25 kV feeder from the Kindersley 72-25 kV substation. The loads in these oilfields have been growing over the past 5 years and have reached a point where SaskPower now requires three 25 kV voltage regulators in the feeder in order to maintain acceptable voltage levels. The increased peak demand associated with the loads is forecast to become an issue in terms of the rating adequacy of the Kindersley substation transformer. The increased demand is also presenting problems in terms of ensuring that the protection systems on the feeder supplying the loads will have satisfactory protection coordination. A number of service applications for new wells in the area have recently been received from customers and more are anticipated. In addition, there are a number of oil well pumps that are presently running off of well head gas and the oil companies are considering converting these to electric drives. There have also been power quality problems in the Marengo and Mantario areas. The operation of several large motors in these oil fields results in voltage fluctuations that violate the permissible limits set by SaskPower for the operation of consumer owned equipment.

In order to accommodate the new loads and improve the existing level of service for customers in the region, SaskPower proposes to extend a 72 kV line from Kindersley, west for approximately 44 km, and to construct a new 72-25 kV substation near Marengo. This project is in SaskPower s five-year capital plan. It is proposed that preliminary work would begin later in 2002, with an in-service date tentatively slated for September of 2004.

5.4.2 Transmission Reinforcement for Kindersley, Kerrobert, Unity

Based on the current forecast of growth for peak load demand in the Ermine area, reinforcement of the Ermine Switching Station may be required by 2010 because of an inability to maintain satisfactory voltages at the switching station delivery point. However, load growth in this area is mainly related to oilfield and pipeline activity, which is subject to volatility.

This makes long-term forecasts difficult. It is expected that this reinforcement would be provided via a new 230 kV transmission line to Ermine from a 230 kV supply point. This supply could come from the Coteau Creek, Queen Elizabeth (Saskatoon), Brada (North Battleford) or Lloydminster Switching Stations.

There has been some discussion by independent power producers of the possibility of new non-utility generation projects in the Kerrobert area. The addition of an appropriately sized, multi-unit generation facility in this area could possibly defer the need for transmission based reinforcement for the Ermine Switching Station. At this time, SaskPower is not aware that any of these projects are being pursued.

It is anticipated that the transmission reinforcement project could occur within the next five to 10 years.

5.5 The City of Saskatoon Study Area

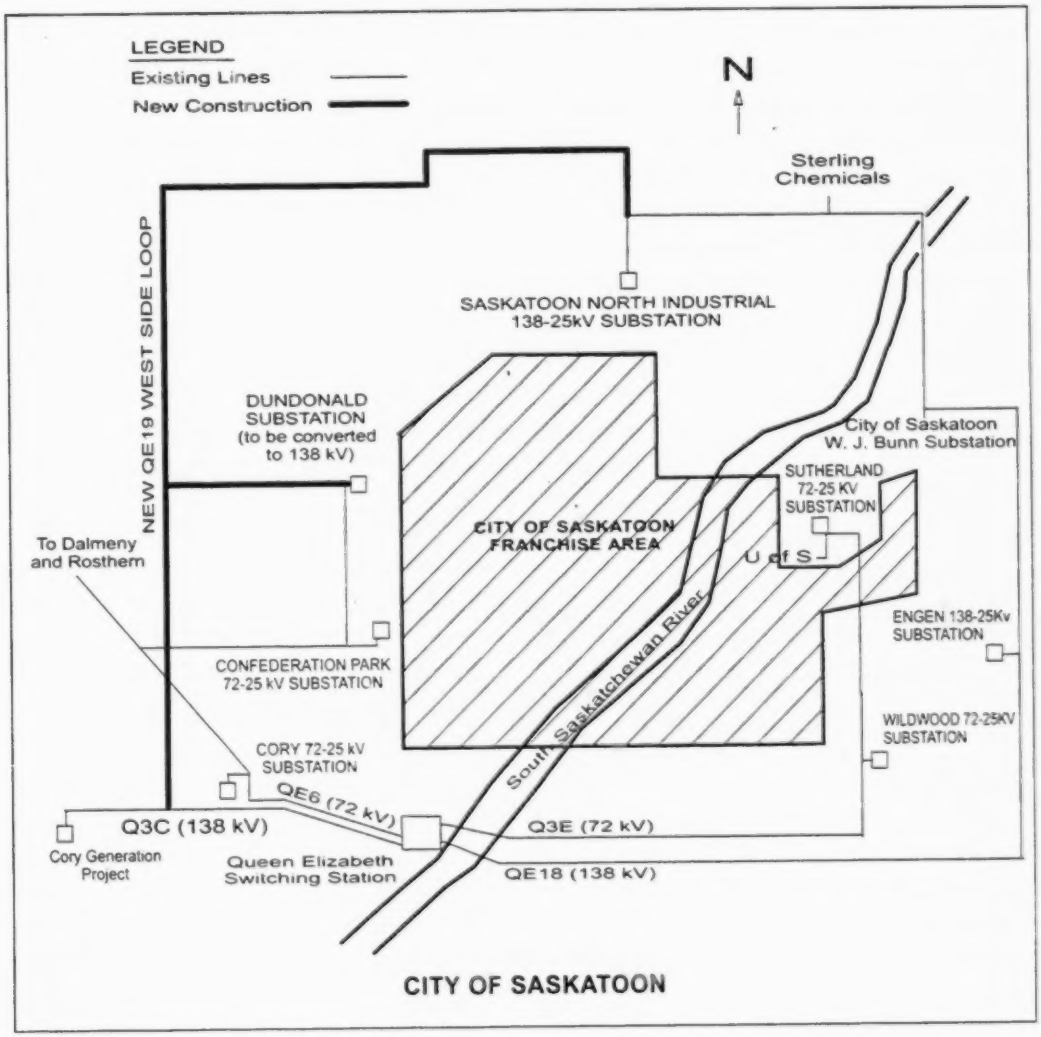
The City of Saskatoon Electrical department serves that portion of Saskatoon that is within the 1958 City boundaries. The area outside of the 1958 boundaries, along with the University of Saskatchewan, is in the SaskPower franchise area and this area has experienced the majority of the new developments in the Saskatoon area. The growth in demand associated with the load in SaskPower s franchise area has averaged 3.7% annually for the past 6 years. The present peak load demand has now reached a point where the three existing transmission lines (QE6, Q3E & QE18), which serve this area, need to be reinforced. QE6 is a 72 kV line, which serves the west side of the City, as well as the customers in and around Dalmeny and Rosthern. Q3E is a 72 kV line that supplies the customers on the east side of the City as well as the University of Saskatchewan and the Royal University Hospital. QE18 serves the customers on the north side of Saskatoon, as well as Sterling Chemicals and a portion of the City of Saskatoon s franchise area.

It is expected that the City of Saskatoon electrical load will continue to grow and that the majority of this load growth will be in SaskPower s franchise area. Based on present load projections, SaskPower plans to carry out the following work in an effort to continue to accommodate this increasing load.

In 2002, the Q3E 72 kV line will be rebuilt from the Queen Elizabeth Switching Station, east for 10.7 km. The new line will have larger conductor and will be insulated for 138 kV, but will continue to operate at 72 kV. The north-south portion of Q3E from the end of the new line north for 3.5 km to the Wildwood Substation will have its existing conductor replaced with larger conductor. The larger conductor will reduce losses, voltage drop and have a higher transfer capability. This project will ensure that the Q3E line will be able to accommodate the new Canadian Light Source synchrotron project load as well as the growing load on the east side of the City.

Figure #8

City of Saskatoon Study Area



Beginning in 2002, SaskPower also plans to begin working on a 138 kV loop around the west side of the City, with a proposed in-service date of 2006. This project will involve extending a 138 kV line from the recently constructed C3Q line around the west and north sides of Saskatoon and tie into the QE18 line in the North Industrial area. There will also be a 138 kV tap off of this new line into the Dundonald Substation. The new line will relieve the load on the existing QE18 line and will provide back up service for the customers in the northern part of Saskatoon. The Dundonald Substation will also be transferred to this new line and will in turn reduce the loading on the QE6 line.

The 138 kV loop project is in SaskPower s five-year capital plan.

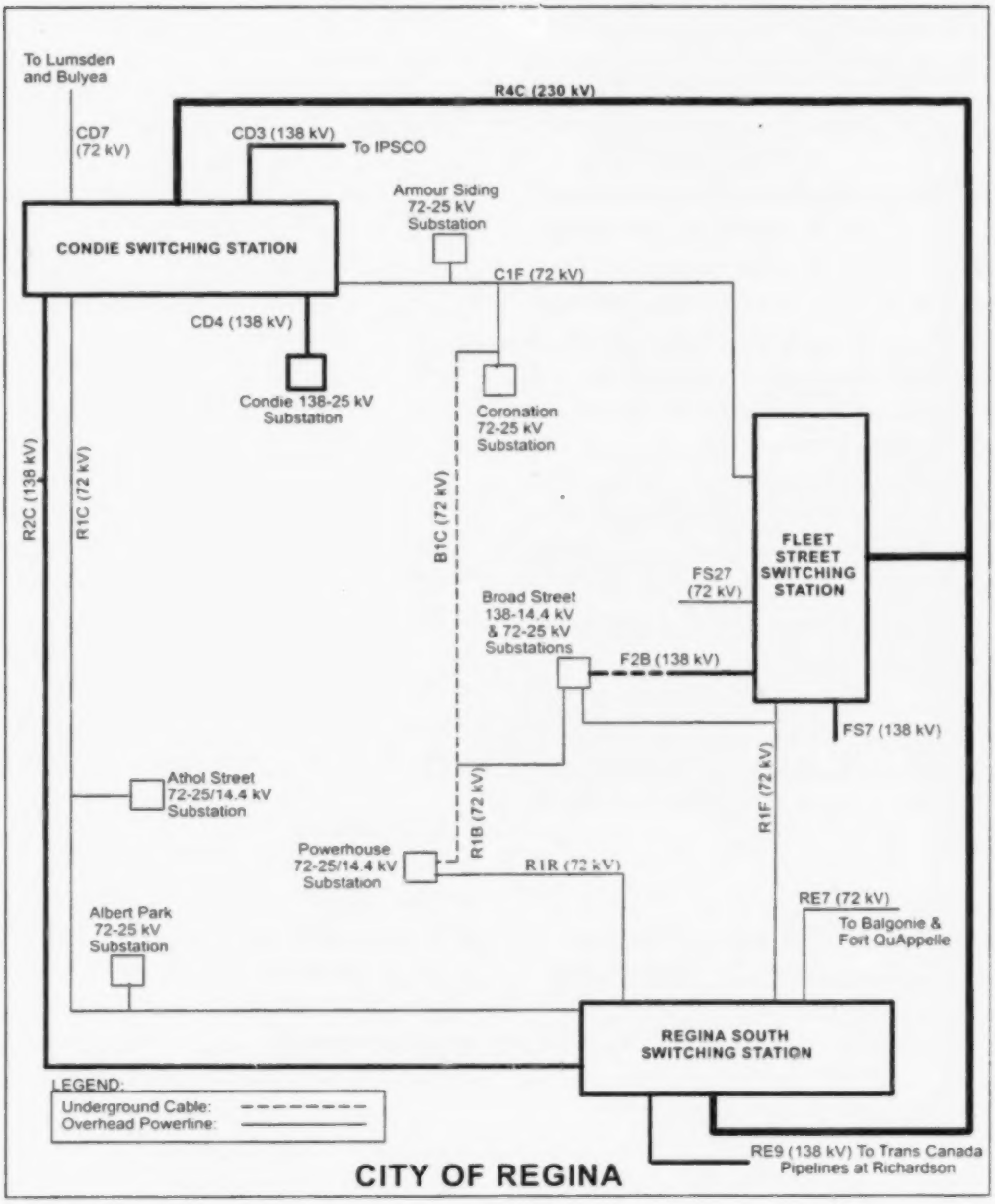
5.6 The City of Regina Study Area

The City of Regina, and the rural areas around the City of Regina, are served by a number of 72 kV and 138 kV power lines, extending from three Switching Stations located on the edges of the City. The Condie Switching Station, located to the northwest of Regina, supplies the residential and commercial customers in the north and northwest portions of the city via the CD4, 138 kV power line and the C1F and R1C 72 kV power lines. In addition, the CD3 138 kV power line serves the IPSCO steel making facility north of Regina. The Regina South Switching Station, located southeast of the city, supplies the customers (including the University of Regina) in the southern portion of the city, via the R1C R1R, RE6, and R1F 72 kV feeders. The RE9, 138 kV power line supplies the Trans Canada Pipeline Station located near Richardson. The Fleet Street Switching Station is located in the northeast area of the city and serves the customers in the east and northeast portion of the city, via the C1F, R1F, FS27 and FS29, 72 kV lines and the F2B and FS7 138 kV feeders. In addition to being supply points for the Regina area loads, the Regina South and Condie Switching Stations are major switching points on SaskPower s transmission grid.

The east side of the City of Regina has been experiencing a significant amount of development over the past 10 years. As a result, the adequacy of the existing electrical distribution facilities in the area are approaching their limits in terms of being able to supply the areas peak load demand. SaskPower plans to address this deficiency by providing a new major infeed to reinforce the distribution system in the area. This will be accomplished by the construction of a new 138-25 kV substation, named Wascana. The proposed location for the new Wascana Substation is approximately one-half of a kilometre north of Highway #1 and adjacent to the CPR railway tracks. SaskPower plans to supply the substation by tapping into the existing RE9 138 kV feeder, which is supplied out of the Regina South Switching Station. The Wascana Substation will be supplied by extending RE9, from a point near Richardson, north

Figure #9

City of Regina Study Area



for approximately 8 km, to the new substation site. Work on the project is expected to begin in 2002, with the in-service date tentatively slated for August of 2004.

As a result of the growth in peak demand associated with the electrical load in the Regina area, transformer capacity increases are planned at the Regina South Switching Station and the Fleet Street Switching Station. These transformer additions are needed to ensure that SaskPower can meet its criteria of continuing to supply the load in major urban areas following failure of one transformer. At the Regina South Switching Station, additional 138-72 kV transformation capacity will be added and at the Fleet Street Switching Station, additional 230-138 kV transformation capacity will be added. It is anticipated that these additions can be accommodated within the boundaries of the property that SaskPower owns at these sites.

The Regina South and Fleet Street Switching station transformer projects are planned to be completed within the next three years and are included in SaskPower s five year capital plan.

SaskPower has evaluated the extension of the RE9 138 kV power line from the future Wascana Substation to the Fleet Street Switching Station. The extension of this power line would provide a 138 k V tie between the Regina South and Fleet Street Switching Stations. Such an interconnection could prove useful in terms of providing back-up capacity in the event of a transformer failure at the Fleet Street Switching Station. This 138 kV tie would defer the need for transformer capacity at the Fleet Street Switching Station. However, SaskPower is not currently pursuing this alternative because it has other lower cost options such as local reinforcement at Fleet Street. This tie may become a viable option in the future.

5.7 Other Projects

5.7.1 Alberta – Saskatchewan Interconnection at Lloydminster

SaskPower has received a request for a merchant transmission interconnection between the transmission system of the Alberta Integrated System (AIS) and SaskPower s transmission system. The interconnection would be located in the Lloydminster area. The purpose of the interconnection would be to facilitate the transfer of electrical energy in and out of the AIS energy market under the provisions of SaskPower s OATT. To facilitate the proposed interconnection, a new 138 kV transmission line will be required between SaskPower s Lloydminster Switching Station and the Alberta border (less than 10 km). Additional transmission reinforcements at other locations in Saskatchewan might be required to facilitate the transfers.

The proposed in-service date for the interconnection is 2003. The project is not currently in SaskPower s five-year capital plan as an interconnection agreement has not been negotiated with the proponent.

5.7.2 Connection of Wind Generation in the Area Southwest of Swift Current

At present, wind generation appears to be the most economical and commercially available technology for supplying demands for GreenPower. The southwest area of the province will soon be the home for two wind projects (SunBridge & Cypress) as the region has a good wind regime and a vast geographic area. The addition of further wind generation will require some upgrading of the existing transmission facilities in the area and, depending on the location of the new wind power projects, there may be a requirement to extend the sub-transmission system.

At the present time there are no firm plans for additional wind generation in the area, but depending on several factors (interest in green power, energy prices, technology, etc) projects may be forthcoming. The reasonably short time frame (less than 1 year) for installing a wind project, allows developers to monitor the market and act quickly when the conditions are right. The short turn around time for these proponents makes it difficult for SaskPower to forecast and plan the development of the transmission system in potential areas, such as the southwest part of the province.

It is anticipated that these projects could occur within the next five years, but the projects are not currently in SaskPower s five-year capital plan.

5.7.3 Alberta Newsprint Mill

Discussions have been taking place with Alberta Newsprint with respect to the development of a new newsprint mill in the north central part of the province. Studies by Alberta Newsprint are at a pre-feasibility stage. As such, the decision to proceed, timing and location of the mill have not been determined. However, the anticipated size of the electrical load associated with the facility suggests that extension of a 230 kV transmission line would be required to provide service to the facility.

It is anticipated that the project could occur within the next five years, but the project is not currently in SaskPower s five-year capital plan.

NERC Planning Standards

I. System Adequacy and Security — A. Transmission Systems

Table I. Transmission Systems Standards Normal and Contingency Conditions

Category	Contingencies		System Limits or Impacts				
	Initiating Event(s) and Contingency Component(s)	Components Out of Service	Thermal Limits	Voltage Limits	System Stable	Loss of Demand or Curtailed Firm Transfers	Cascading [c] Outages
A - No Contingencies	All Facilities in Service	None	Normal	Normal	Yes	No	No
B - Event resulting in the loss of a single component.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of a Component without a Fault.	 Single Single Single Single	 Applicable Rating [a] (A/R) A/R A/R A/R	 Applicable Rating [a] (A/R) A/R A/R A/R	 Yes Yes Yes Yes	 No [b] No [b] No [b] No [b]	 No No No No
	Single Pole Block, Normal Clearing: 4. Single Pole (dc) Line	Single	A/R	A/R	Yes	No [b]	No
C - Event(s) resulting in the loss of two or more (multiple) components.	SLG Fault, with Normal Clearing: 1 Bus Section 2 Breaker (failure or internal fault)	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG or 3Ø Fault, with Normal Clearing, Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Multiple	A/R	A/R	Yes	Planned [d]	No
	Bipolar Block, with Normal Clearing: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing: 5. Double Circuit Towerline	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No
	SLG Fault, with Delayed Clearing: 6. Generator 8. Transformer 7. Transmission Circuit 9. Bus Section	Multiple Multiple	A/R A/R	A/R A/R	Yes Yes	Planned [d] Planned [d]	No No

NERC Planning Standards

I. System Adequacy and Security — A. Transmission Systems

D [c] - Extreme event resulting in two or more (multiple) components removed or cascading out of service	3Ø Fault, with Delayed Clearing (stuck breaker or protection system failure): 1. Generator 2. Transmission Circuit 3. Transformer 4. Bus Section 3Ø Fault, with Normal Clearing: 5. Breaker (failure or internal fault) Other: 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of a all generating units at a station 11. Loss of a large load or major load center 12. Failure of a fully redundant special protection system (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant special protection system (or remedial action scheme) for an event or condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from disturbances in another Regional Council.	Evaluate for risks and consequences. · May involve substantial loss of customer demand and generation in a widespread area or areas. · Portions or all of the interconnected systems may or may not achieve a new, stable operating point. · Evaluation of these events may require joint studies with neighboring systems. · Document measures or procedures to mitigate the extent and effects of such events. · Mitigation or elimination of the risks and consequences of these events shall be at the discretion of the entities responsible for the reliability of the interconnected transmission systems.

Footnotes to Table I.

a) Applicable rating (A/R) refers to the applicable normal and emergency facility thermal rating or system voltage limit as determined and consistently applied by the system or facility owner.

b) Planned or controlled interruption of generators or electric supply to radial customers or some local network customers, connected to or supplied by the faulted component or by the affected area, may occur in certain areas without impacting the overall security of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted firm (non-recallable reserved) electric power transfers.

c) Cascading is the uncontrolled successive loss of system elements triggered by an incident at any location. Cascading results in widespread service interruption which cannot be restrained from sequentially spreading beyond an area predetermined by appropriate studies.

d) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, or the curtailment of contracted firm (non-recallable reserved) electric power transfers may be necessary to maintain the overall security of the interconnected transmission systems.

e) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

APPENDIX B

Summary of Capital Expenditures on Transmission System for 2002 to 2006

Appendix B (pg. 40-42) provides a listing of all the transmission projects that have been included in SaskPower s five-year capital plan. The five-year spending plan is updated quarterly. The plan shown here as Appendix B was the most current version when this document was being prepared. In the interest of keeping the list relevant, not all transmission projects in SaskPower s five-year capital plan are listed in Appendix B. Projects that involve the communications, protection or control facilities associated with SaskPower s transmission system are not listed because they generally do not have any impact on the public. Projects that have expenditures over the five year period that total less than $50,000 have also been deleted from the list in the interest of brevity.

Transmission Capital Projects
2002 - 2006 Capital Plan

Project status: A - Indicates that project has been internaly approved by SaskPower for construction

Project ID	Project Title	Project Driver	Project Status	Budget 2002	Budget 2003	Budget 2004	Budget 2005	Budget 2006	Budget Totals
	MEADOW LAKE AREA PROJECTS								
D428	ML3 72 KV LINE REBUILD - STAGE 2	Adequacy violation due to load growth	A	$2,734,051	$0	$0	$0	$0	$2,734,051
D425	ML3 72 KV LINE REBUILD - STAGE 3	Adequacy violation due to load growth		$3,049,000	$0	$0	$0	$0	$3,049,000
	ML3 72 KV LINE REBUILD - STAGE 4	Adequacy violation due to load growth		$0	$0	$500,000	$1,500,000	$3,500,000	$5,500,000
	MEADOW LAKE 230 KV SWITCHING STATION	Load growth - 1st contingency reliability		$250,000	$4,750,000	$0	$0	$0	$5,000,000
T050	TOLKO OSB PLANT PRELIMINARY ROUTING	New Customer Load	A	$130,000	$0	$0	$0	$0	$130,000
	PRINCE ALBERT AREA PROJECTS								
D474	LINE - PA8 Rebuild - Stage 2	Adequacy violation due to load growth	A	$65,000	$763,000	$0	$0	$0	$828,000
D474	SS - PA8 Rebuild - Stage 2 (Timber Cove)	Adequacy violation due to load growth	A	$400,000	$1,431,115	$0	$0	$0	$1,831,115
D474	CP&C - PA8 Rebuild Stage 2	Adequacy violation due to load growth	A	$0	$801,000	$0	$0	$0	$801,000
D474	PA8 LINE REBUILD - STAGE 2	Adequacy violation due to load growth	A	$465,000	$2,995,115	$0	$0	$0	$3,460,115
T164	PA8 REBUILD - STAGE 1 - Phase II	Adequacy violation due to load growth	A	$4,613,000	$300,000	$0	$0	$0	$4,913,000
	PA8 REBUILD STAGE 3	Adequacy violation due to load growth		$100,000	$2,700,000	$8,000,000	$0	$0	$10,800,000
	CHRISTOPHER LAKE SUBSTATION - CONVERSION TO 138 KV	Change in supply voltage		$0	$1,400,000	$0	$0	$0	$1,400,000
	SASKATOON AREA PROJECTS								
T174A	GENERATION CONNECTION - QUEEN ELIZABETH UNIT 1 REPOWERING PROJECT	New generation connection	A	$19,000	$0	$0	$0	$0	$19,000
T175A	GENERATION CONNECTION - CORY COGENERATION PROJECT	New generation connection	A	$5,110,855	$0	$0	$0	$0	$5,110,855
T176A	QUEEN ELIZABETH SWITCHING STATION FACILITY UPGRADES	Replacement / Rebuild	A	$2,580,375	$1,664,996	$0	$0	$0	$4,245,371
T181-AB	QE19 138 KV WEST SIDE LOOP PROJECT	Adequacy violation due to load growth	A	$42,000	$62,000	$100,000	$6,097,000	$1,217,000	$7,518,000
D464	Q3E - QUEEN ELIZABETH 72 LINE REBUILD - STAGE 1	Adequacy violation due to load growth	A	$1,450,000	$0	$0	$0	$0	$1,450,000
	CORY SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability		$0	$0	$0	$805,000	$0	$805,000
D369	DUNDONALD SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability		$0	$0	$0	$0	$578,000	$578,000
	WILDWOOD SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability		$0	$0	$712,000	$0	$0	$712,000
T195	SASKATOON NORTH INDUSTRIAL SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability	A	$150,000	$0	$0	$0	$0	$150,000

Transmission Capital Projects
2002 - 2006 Capital Plan

Project status: A - indicates that project has been internaly approved by SaskPower for construction

Project ID	Project Title	Project Driver	Project Status	Budget 2002	Budget 2003	Budget 2004	Budget 2005	Budget 2006	Budget Totals
	ENGEN 138-25 KV SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability		$0	$0	$0	$0	$615,000	$615,000
	REGINA AREA PROJECTS								
D317A	REGINA POWERHOUSE SUBSTATION REBUILD	Replacement / Rebuild	A	$2,710,111	$0	$0	$0	$0	$2,710,111
T042	FLEET STREET SWITCHING STATION - ADDITION OF SECOND 230-138kV TRANSFORMER	Load growth - 1st contingency reliability		$2,080,000	$2,131,000	$0	$0	$0	$4,211,000
T157	REGINA SOUTH SWITCHING STATION - ADDITION OF THIRD 138-72kV TRANSFORMER	Load growth - 1st contingency reliability		$1,135,000	$1,197,000	$0	$0	$0	$2,332,000
T105	REGINA - WASCANA SUBSTATION PROJECT	Adequacy violation due to load growth	A	$250,000	$1,478,000	$2,530,000	$0	$0	$4,258,000
T109	FLEET STREET SWITCHING STATION 138-25 kV TRANSFORMER ADDITION	Adequacy violation due to load growth		$0	$0	$0	$0	$18,000	$18,000
	OTHER PROJECTS								
T191	SENLAC 138-25 KV SUBSTATION PROJECT	Adequacy violation due to load growth	A	$2,813,000	$0	$0	$0	$0	$2,813,000
T203A	CANTUAR SUBSTATION PROJECT	Replacement	A	$272,000	$0	$0	$0	$0	$272,000
D305	DAVIDSON 72-25 kv SUBSTATION TRANSFORMER CAPACITY INCREASE	Customer Driven Capacity		$0	$629,000	$0	$0	$0	$629,000
D334	GLASLYN SUBSTATION REBUILD	Replacement		$281,000	$500,000	$0	$0	$0	$781,000
D358	SHAUNAVON SUBSTATION TRANSFORMER CAPACITY INCREASE	Customer Driven Capacity		$0	$0	$0	$0	$783,000	$783,000
T015	CODETTE SWITCHING STATION - ADDITION OF SECOND 230/72kV TFMR	Load growth - 1st contingency reliability		$1,116,500	$1,178,500	$0	$0	$0	$2,295,000
	SWIFT CURRENT 138-72 KV TRANSFORMER CHANGEOUT	Load growth - 1st contingency reliability		$500,000	$0	$0	$0	$0	$500,000
T159	SWIFT CURRENT SWITCHING STATION - ADDITION OF 138-72kV TRANSFORMER	Load growth - 1st contingency reliability		$0	$50,000	$4,952,000	$0	$0	$5,002,000
	SWIFT CURRENT DISTRIBUTION SUSBSTATION REBUILD	Replacement / Rebuild		$300,000	$1,000,000	$0	$0	$0	$1,300,000
T182	TANTALLON SWITCHING STATION - ADDITION OF 138-72kV TRANSFORMER CAPACITY	Load growth - 1st contingency reliability		$0	$0	$4,582,000	$0	$0	$4,582,000
T197	CHAPLIN SWITCHING STATION - SECOND 138-72kV TRANSFORMER	Load growth - 1st contingency reliability		$0	$0	$0	$2,323,000	$0	$2,323,000
	L2E 138 KV LINE VOLTAGE REINFORCEMENT - HEARTS HILL CAPACITOR	Adequacy violation due to load growth		$0	$0	$0	$0	$1,000,000	$1,000,000
	MIDALE 72-25 KV SUBSTATION TRANSFORMER CAPACITY INCREASE.	Adequacy violation due to load growth		$0	$800,000	$0	$0	$0	$800,000
	Glaslyn Capacitor Move	Reliability		$100,000	$0	$0	$0	$0	$100,000
	FUTURE REPLACEMENT OF EXISTING WOOD DISTRIBUTION SUBSTATIONS DUE TO DETERIORATION	Replacement / Rebuild		$0	$2,000,000	$2,000,000	$2,000,000	$2,000,000	$8,000,000

Transmission Capital Projects
2002 - 2006 Capital Plan

Project status: A - Indicates that project has been internaly approved by SaskPower for construction

Project ID	Project Title	Project Driver	Project Status	Budget 2002	Budget 2003	Budget 2004	Budget 2005	Budget 2006	Budget Totals
	PONTRILAS DISTRIBUTION SUBSTATION REBUILD	Replacement / Rebuild		$0	$800,000	$0	$0	$0	$800,000
	PELICAN NARROWS – DESCHAMBAULT LAKE AREA REINFORCEMENT	Adequacy violation due to load growth		$2,440,000	$12,845,000	$0	$0	$0	$15,285,000
T299	NERC COMPLIANCE PHASE I & II - TRANSMISSION UPGRADES	Contingent project		$2,000,000	$1,800,000	$0	$0	$0	$3,800,000
C686	NERC COMPLIANCE PHASE I & II - COMMUNICATION, PROTECTION AND CONTROL UPGRADES	Contingent project		$100,000	$100,000	$100,000	$0	$0	$300,000
	Apache Canada - Midale: 72 kV Service	New customer load		$1,365,000	$0	$0	$0		$1,365,000
	Wood Pole Life Extension	Replacement / rebuild		$10,000,000	$10,000,000	$10,000,000	$10,000,000	$10,000,000	$50,000,000
D313	NIPAWIN SUBSTATION REBUILD	Replacement / rebuild	A	-$320,000	$0	$0	$0	$0	-$320,000
D318	RED JACKET SUBSTATION 72-25 KV TRANSFORMER CAPACITY INCREASE.	Adequacy violation due to load growth	A	$301,000	$0	$0	$0	$0	$301,000
D342A	SUNBRIDGE WIND GENERATION PROJECT CONNECTION	New Generation	A	$455,000	$0	$0	$0	$0	$455,000
D344	PARKMAN 72 25 KV SUBSTATION	Adequacy violation due to load growth	A	$1,245,000	$0	$0	$0	$0	$1,245,000
D366	BALGONIE SUBSTATION TRANSFORMER CAPACITY INCREASE	Adequacy violation due to load growth	A	$10,000	$60,000	$0	$0	$0	$70,000
D380	MOOSE JAW 'A' SUBSTATION TRANSFORMER CAPACITY INCREASE	Load growth - 1st contingency reliability	A	$1,986,000	$0	$0	$0	$0	$1,986,000
T006	PEEBLES SWITCHING STATION 230-138 KV TRANSFORMER ADDITION	Load growth - 1st contingency reliability	A	$2,408,000	$0	$0	$0	$0	$2,408,000
T045	BEATTY SWITCHING STATION - ADDITION OF THIRD 230-138kV TRANSFORMER ADDITION	Load growth - 1st contingency reliability	A	$3,126,000	$0	$0	$0	$0	$3,126,000
T045	BOUNDARY DAM SWITCHING STATION - REPLACEMENT OF 901T 230-138 KV TRANSFORMER	Load growth - 1st contingency reliability	A	$1,684,000	$0	$0	$0	$0	$1,684,000